Please insert the following heading on page 4 after paragraph 6, line 17.

BRIEF DESCRIPTON OF THE DRAWINGS

Please insert the following heading on page 5 after paragraph 3, line 4.

DETAILED DESCRIPTION

Page 6, paragraph 4, lines 18 to 28 amend the following paragraph:

Figures 8 and 9 illustrate another embodiment of the microphone applied ~~87~~ as an in-the-ear hearing assist or aid. In this case, the microphone is physically separated into right and left hand elements 68 and 70 respectively, that are allochiral or mirror-symmetrical. Each component has an earpiece 72 moulded to fit the ear of a user. The microphone element is embedded in the earpiece along with an amplifier 74 and an earphone transducer 76. The microphone element has a cylindrical housing 78 and is constructed in the same way as one end of the microphone of Figures 1 through 4. The microphone transducer is the input source to the amplifier 74 which drives the earphone transducer 76. When worn, the axis of each component is at least generally aligned with the lateral, horizontal tilt axis Y-Y of the head, to pass through the "zero point" 79 where the tilt axis intersects the vertical rotation axis Z-Z of the head.

The paragraph bridging pages 8 and 9, page 8, paragraph 9, lines 21 to 26 and page 9, paragraph 1, lines 1 to 5, amend the following paragraph.

7. While the duplex theory of sound source localization has served well for the understanding of two-dimensional horizontal planar space, it is incomplete. The geometry of the vestibular apparatus suggests a tetrahedral-octahedral four-

dimensional reference frame that accommodates, in all directions about a precise point, sound source range determination and localization information. A virtual center for precision space-time located midway between the tympani is proposed and the orthogonally-placed regular tetrahedron about that center serves as the virtual template for central comparison and peripheral adjustment whereby, no matter what changes in size and shape of the head and body over time, the individual maintains a capacity for precision space-time orientation. As observed in the barn owl, recent studies suggest gating of instructive error signals to be the mechanism for this. <u>(Marcia Barinaga: "Sight, Sound Converge in Owl's Mental Map" SCIENCE Vol. 297, 30 August 2002, pp. 1462-3 and Yoram Gutfreund, Weimin Zheng, Eric I. Knudsen: "Gated Visual Input to the Central Auditory System" SCIENCE Vol. 297, 30 August 2002, pp. 1556-9)</u>

The paragraph bridging pages 9 and 10, page 9, paragraph 3, lines 20 to 26 and page 10, paragraph 1, lines 1 to 4, amend the following paragraph.

Based on experience with the 'precision microphone' and the 'precision loudspeaker' which, taken together, are a working model of the human hearing system, the virtual topographic map is comprised of a series of concentric spheres whereby an event related potential (ERP) is mapped onto that sphere whose radius demonstrates relative range along a proximal-distal axis. The medial olivary complex is challenged by Interaural frequency difference (IFD) which is a product of Doppler-like shifts in the frequency of an identifier resulting from head shape. Further central processing leads to the potential for conscious identification of the sound source by humans together with the potential for knowing, with intent, both the range and the location of that source, while the map of concentric circles may begin to explain the experience of

externalization whereby the sound source is perceived to be 'out there'. (George D. Pollak: "Model Hearing" NATURE Vol. 417, 30 May 2002 and Antje Brand, Oliver Behrend, Torsten Marquardt, David McAlpine and Benedict Grothe: "Precise Inhibition is Essential for Microsecond Interaural Time Difference Coding" NATURE Vol. 417, 30 May 2002)

The paragraph bridging pages 14 and 15, page 14, paragraph 5, lines 25 to 27 and page 15, paragraph 1, lines 1 to 6, amend the following paragraph.

Giard et al. (Giard et al., Frontiers in Bioscience, v5, d84-94, January 1, 2000) show on page 7 a graph depicting Primary and Secondary Bands where 'Primary Band' represents consciously attended information. It is proposed that in the outer hair cells row 3 relates to the identifier in auditory scene analysis and is available for conscious consideration. Range information, received simultaneously, derives from row 3 and can be known. Rows 2, 3, 4 taken together, relate to sound source localization and, while yielding information simultaneously received, can be known but is not available for conscious consideration. Rows 2 and 4 are probably the generators of *secondary band* information.

Page 15, paragraph 2, lines 7 to 18 amend the following paragraph:

It is conjectured that for humans there is a single horizontal tilt axis articulating on the occipito-atlantic joint and which passes through the centers of the oval tympani or slightly higher through the centers of the oval windows of the inner ear. An approximate surface location is the small depression just antero-superior to the tragus on each side of the head. For microphone and loudspeakers the axis passes through the center of the oval openings and through the center of the structure. The

vertical rotational axis of the head probably intersects the horizontal axis in the human except, possibly, in some psychopathological states (Feldenkrais – Feldenkrais, M: "Body and Mature Behavior" a Study of Anxiety, Sex, Gravitation and Learning", 1949, Madison CT, International Universities Press, 163 pp). The intersection of horizontal and vertical rotation axes is referred to as zero-point which, in the equilibrious state, is the center of volume of regular tetrahedron. Articulation about a precise zero-point permits accurate determination of location of a sound source.

Page 16, paragraph 4, lines 13 to 24 amend the following paragraph:

Reports in the literature (Semple, Malcolm N.:"Auditory perception: Sounds in a Virtual World", Nature 396, 721-724 (1988) and Kulkarni, Abhjit and Colburn, Steven H.: "Role of Spectral Detail in Sound Source Localization", Nature 396 747-749 (1988) suggest that our ability to externalize the experience of sound is determined by head-related transfer functions. Our experience is that 'precision microphone' consistently yields images that are externalized and localized spherically (720°) when heard over headsets without reference to filtering (relative boosting, attenuating and delaying of component frequencies) of incoming sound waves. Our analyses suggest that the invariantly proportioned shape of the precision microphone' yields Doppler-like frequency shifting (up and down) that may be algorithm-managed to produce precision determination of location and range, and a corollary hypothesis is that the planar congruence of tympanic ellipses with orthogonally-placed (in Earth's gravitational field) regular tetrahedral shape is the primary factor in human externalization and localization and, that there is also clear congruence with the planes of the semi-circular canals of the vestibular apparatus.

The paragraph bridging pages 17 and 18, page 17, paragraph 7, lines 22 to 25 and page 18, paragraph 1, lines 1 to 5, insert the following paragraph.

By taking a single orlid <u>(Orlid' refers to a cylinder cut perpendicular to the axis at one end and truncated at the other end at an angle of 30° 16'. Two orlids joined at their cross sections and with the long axes of both elliptical openings set at 45° to the horizontal constitute the body of 'precision microphone' in an orthogonal relationship to the horizon.)</u> and placing it on a plain white surface with the right angle truncation down and placing it in coherent light such as that from the bright sun and then rotating it, an internal shadow moves in a cyclic fashion yielding a sinusoidal curve. A similar situation prevails when coherent (natural) sound information falls on the orlid. Another approach is to take the single orlid and wrap a sheet of white paper around it and then trace out the elliptical outline of the orlid onto the paper, an externally-derived sinusoidal curve appears. This can readily be done using a double orlid and the functional significance of the dynamics of localization begin to suggest themselves.